

REMARKS

Claims 1-7 and 9-13 are pending in the present Application. Claim 1 has been amended, leaving Claims 1-7 and 9-13 for consideration upon entry of the present Amendment.

Support for the amendment to Claim 1 can be found in at least on page 4 lines 8 – 12, where it is stated that “According to another aspect of the present invention, there is provided a process of hydroformylation of olefin compounds, comprising reacting the olefin compound with a gas mixture of hydrogen and carbon monoxide while being stirred at elevated pressures and temperatures in the presence of the above catalyst composition to produce an aldehyde.”

Reconsideration and allowance of the claims are respectfully requested in view of the above amendments and the following remarks.

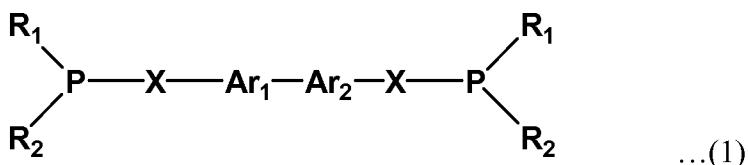
Claim Rejections Under 35 U.S.C. § 103(a)

Claims 1-3, 5-7, 9 and 10 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 6, 153,800, by Gelling et al. (hereinafter “Gelling”) in view of “Organometallics, 2002, 3873-3883” by van der Slot et al. (hereinafter “van der Slot”). Applicants respectfully traverse this rejection.

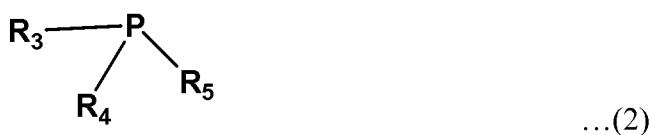
For an obviousness rejection to be proper, the Examiner must meet the burden of establishing that all elements of the invention are disclosed in the prior art; that the prior art relied upon, or knowledge generally available in the art at the time of the invention, must provide some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references; and that the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988). The obviousness inquiry also requires consideration of common knowledge and common sense. *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1742-43 (2007); *DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1367 (Fed.

Cir. 2006) (“Our suggestion test is in actuality quite flexible and not only permits, but requires, consideration of common knowledge and common sense.”)

Claim 1 as presently amended is directed to a catalyst composition for hydroformulating an alpha-olefin compound comprising a bidentate ligand represented by formula 1, a monodentate ligand represented by formula 2, and a transition metal catalyst represented by formula 3:



wherein each of R₁ and R₂ is a substituted or unsubstituted C1-20 alkyl group; a substituted or unsubstituted C1-20 alkoxy group; a substituted or unsubstituted C5-20 cycloalkane or cycloalkene; a substituted or unsubstituted C6-36 aryl group; a substituted or unsubstituted C1-20 heteroalkyl group; a substituted or unsubstituted C4-36 heteroaryl group; or a substituted or unsubstituted C4-36 heterocyclic group, Ar₁-Ar₂ is a bisaryl compound, and X is oxygen (O) or sulfur (S),



wherein each of R₃, R₄ and R₅ is a substituted or unsubstituted C1-20 alkyl group; a substituted or unsubstituted C1-20 alkoxy group; a substituted or unsubstituted C5-20 cycloalkane or cycloalkene; a substituted or unsubstituted C6-36 aryl group; a substituted or unsubstituted C1-20 heteroalkyl group; a substituted or unsubstituted C4-36 heteroaryl group; or a substituted or unsubstituted C4-36 heterocyclic group, each of R₃, R₄ and R₅ being optionally substituted with nitro (-NO₂), fluorine (F), chlorine (Cl), bromine (Br), or a C1-4

alkyl group,

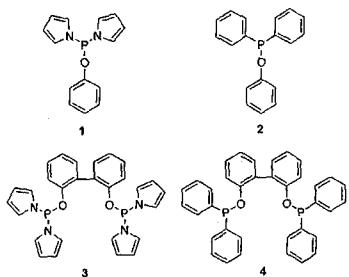


wherein M is a transition metal, each of L_1 , L_2 and L_3 is hydrogen, CO, acetylacetone, cyclooctadiene, norbornene, chlorine, or triphenylphosphine, and each of l, m and n is a number of 0 to 5, provided that all l, m and n are not zero simultaneously; and wherein the concentration of the transition metal is 50 to 500 ppm based on the amount of the catalyst composition, and the concentration of the bidentate ligand is 0.5 to 20 mol and the concentration of the monodentate ligand is 0.1 to 50 mol, respectively per mol of the transition metal.

In the first instance, the Applicants would like to point out that the Examiner has combined Gelling in view of Van der Slot to reject the claimed invention. The Applicants believe that the Examiner intended to reject the claimed invention over Van der Slot in view of Gelling.

Van der Slot teaches using bidentate phosphorous amidite and phosphinate ligands with a rhodium catalyst. (See title and see abstract) In particular, Van der Slot teaches the following structures in its Scheme 1 shown below:

Scheme 1. Monodentate and Bidentate Phosphorus Amidite and Phosphinite Ligand Structures



Van der Slot does not teach a monodentate phosphine ligand ($P(OR)_3$). Van der Slot only teaches the use of multidentate phosphinite ligands ($P(OR)_2R_2$). Van der Slot further does not teach that the concentration of the transition metal is 50 to 500 ppm based on the amount of the catalyst composition, and the concentration of the bidentate ligand is 0.5 to 20 mol and the concentration of the monodentate ligand is 0.1 to 50 mol, respectively per mol of the

transition metal. Van der Slot thus does not teach all elements of the claimed invention.

Gelling teaches a catalyst system comprising a monodentate phosphine ligand, a bidentate phosphate ligand and a suitable rhodium or iridium compound. (See Abstract and see Col. 6, lines 23 – 25) Gelling does not teach that the concentration of the transition metal is 50 to 500 ppm based on the amount of the catalyst composition, and the concentration of the bidentate ligand is 0.5 to 20 mol and the concentration of the monodentate ligand is 0.1 to 50 mol, respectively per mol of the transition metal. Gelling also does not teach all elements of the claimed invention. Gelling does not correct for the deficiency of Van der Slot. Since both Van der Slot and Gelling do not teach all elements of the claimed invention, there is no motivation to combine references.

The results discussed in Van der Slot would demotivate one of ordinary skill in the art from combining references. In particular, with reference to the Table 5 shown below, Van der Slot teaches that compositions that contain only bidentate ligands show an improved reactivity over time.

Table 5. Results of the Hydroformylation of 1-Octene with Ligands 3 and 4^a

Ligand	L/Rh	time (h)	conversion (%)	1/b	TOF ^b	linear (%)	2-octenes (%)
3	1.5	0.10	33	107	10 × 10 ³	86	11
	3	0.054	20	110	10 × 10 ³	92	7
	10	0.27	46	98	5 × 10 ³	86	13
	50	0.55	23	104	1 × 10 ³	85	15
4 ^c	3	1.5	24	5	424	80	5
	5	2.5	20	9	246	85	5
	50	3.0	21	6	240	83	3

From the Table 5, it may be seen that as the time of reaction increases from 1.5 hours to 3.0 hours (See Column 3), the selectivity of the reaction increases from 5 to 6 ~9 (See Column 5). One of ordinary skill in the art reading these results and noticing the improvement in selectivity with increasing time using only a bidentate would find no reason to replace some of the bidentate with the monodentate prescribed by Gelling.

In addition, Van der Slot discourages one of ordinary skill in the art from replacing the bidentate with a monodentate phosphite. In particular, on page 3874 lines 7 – 12, Van der Slot

states that “[B]ulky bidentate phosphites can give high selectivity to linear aldehydes, but these catalysts are less active than bulky monophosphites”. One of ordinary skill in the art reading this admonition would not be motivated to substitute the bidentate phosphates of Van der Slot with the monodentate phosphites of Gelling. Van der Slot thus teaches away from Gelling. Case law holds that “[I]t is improper to combine references where the references teach away from their combination.” *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983)

In addition, the Applicants would like to point out to the Examiner that in the Affidavit submitted on August 14, 2009, the examples clearly reflect that a mixture of a monodentate ligand and a bidentate ligand show decreased catalytic activity. Examining Comparative Examples 4, 5 and 6 in the Affidavit clearly shows that when a monodentate ligand and a bidentate ligand (as in Example 6) is contained in the catalyst composition, the catalytic activity is significantly decreased.

The Applicants respectfully request the Examiner to re-examine the Affidavit submitted on August 14, 2009. In this Affidavit, in Comparative Example 6, it may be seen that a mixture of a monodentate ligand and bidentate ligand shows decreased catalytic activity.

Additionally, from the Table 1 in the present Application (see page 8 of the Application as filed), it may be seen that as the level of the monodentate ligand is increased with respect to the bidentate ligand and the rhodium compound (See Examples 1 – 4 in Table 1) the catalytic activity is decreased while the selectivity remains fairly constant. Combining the results from the Table 1 of the present application with the results from the Affidavit, one would conclude that combining the monodentate ligand with the bidentate ligand reduces catalytic activity while causing the selectivity to remain constant.

Thus while the addition of the monodentate ligand may reduce costs (as disclosed by Gelling), it does not provide any advantage (selectivity remains constant – see Col. 1, lines 52 – 60 of Gelling). One of ordinary skill in the art noting this disadvantage (reduced catalytic activity and no increase in selectivity) by using a monodentate ligand would not be motivated

to remove the bidentate ligands of Van der Slot (which provide increased catalytic activity and increased selectivity) and replace some of them with the monodentate ligand of Gelling.

The Applicants believe that the combination has been made using hindsight gained from the claimed invention. Since Van der Slot teaches away from the claimed invention and since the results in Gelling show no benefit other than a reduction in cost, the Applicants believe that the Examiner has combined Van der Slot with Gelling using the present invention as a template.

The Examiner has stated that Gelling teaches that adding a monodentate ligand to the bidentate ligand increases the life of the catalyst. (See page 5 of the Office Action) The Applicants disagree. If as seen from Table 1, the catalytic activity is significantly decreased from adding the monodentate ligand, what is the purpose of increasing catalyst life. Increased catalyst life does not increase the production of the olefin.

Applicants further maintain that the Examiner has used an improper standard in arriving at the rejection of the above claims under section 103, based on improper hindsight, which fails to consider the totality of applicant's invention and to the totality of the cited references. More specifically the Examiner has used Applicant's disclosure to select portions of the cited references to allegedly arrive at Applicant's invention. In doing so, the Examiner has failed to consider the teachings of the references or Applicant's invention as a whole in contravention of section 103, including the disclosures of the references, which teach away from Applicant's invention.

Section 103 sets out the test for obviousness determinations. It states, in pertinent part, that such determinations are to be made by consideration of

... the differences between subject matter sought to be patented and the prior art such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the [pertinent] art.

In making a Section 103 rejection, the Examiner bears the burden of establishing a *prima facie* case of obviousness. *In re Fine*, 5 U.S.P.Q. 2d 1596, 1598 (Fed. Cir. 1998). The Examiner "... can satisfy this burden only by showing some objective teaching in the prior

art or that knowledge generally available to one of ordinary skill in art would lead that individual to combine the relevant teachings of the references". *Id.*

Since both Gelling and Van der Slot do not teach all elements of the claimed combination and since there is no motivation to combine references, the Applicants believe that the Examiner has not made a *prima facie* case of obviousness over Gelling in view of Van der Slot or Van der Slot in view of Gelling. The Applicants respectfully request a withdrawal of the obviousness rejection and an allowance of the claims.

Conclusion

It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance are requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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